

## REMARKS

Reconsideration of this application is respectfully requested in view of the remarks made herein.

### STATUS OF CLAIMS AND SUPPORT FOR AMENDMENTS

Upon entry of this amendment, claims 1, and 12-25 will be pending in this application. Claims 2-11 have been canceled without prejudice to, or disclaimer of, their subject matter.

The specification has been amended to include the headings suggested in MPEP § 608.01(a), and to include a brief description of the drawing.

Claim 1 has been amended to recite that the hydrometallurgic processing of the slag contains a leaching step and a conversion step, to recite that the leaching step includes combining the slag with sulfuric and/or hydrochloric acid, an iron sulfate solution, and an oxygen-containing gas, to produce an iron-depleted copper sulfate solution. Support for this amendment can be found in the specification, *inter alia*, at page 3, line 27 to page 4, line 14 and at page 6, line 26 to page 7, line 4.

Claim 1 has also been amended to recite that conversion step includes combining the iron-depleted copper sulfate solution produced by the leaching step with a sulfide-containing concentrate to produce copper sulfide and an iron sulfate solution, which iron sulfate solution is recycled to the leaching step. Support for this amendment can be found in the specification, *inter alia*, at page 4, lines 16-29 and at page 6, line 26 to page 7, line 9.

New claim 20 is supported by the specification, *inter alia*, at page 4, lines 27-29.

New claim 21 is supported by the specification, *inter alia*, at page 7, lines 6-7.

New claim 22 is supported by the specification, *inter alia*, at page 4, line 3.

New claim 23 is supported by the specification, *inter alia*, at page 6, lines 9-24.

New claims 24 and 25 are supported by the specification, *inter alia*, at page 5, line 30 to page 6, line 3.

No new matter has been added.

#### OBJECTION TO DRAWING

In paragraph 3 of the Office action, the Examiner has objected to the drawing, alleging that "they do not include the following reference sign(s) mentioned in the description: 1-14, 16-18, and 20-21 (present in para 0026-0028). Applicants respectfully traverse this objection, because it appears to have been made in error; there are no paragraphs 0026-0028 in the publication of this application, and all of the reference numerals mentioned in the Office action appear in FIG. 1. Withdrawal of the objection is therefore respectfully requested.

#### OBVIOUSNESS REJECTIONS

##### A. Claims 1-7 and 9-10 over Schlitt, Gabb, and Johnson

In paragraph 4 of the Office action, the Examiner has rejected claims 1-7 and 9-10 under 35 U.S.C. § 103(a) as obvious over U.S. Patent No. 4,152,142 (Schlitt) in view of U.S. Patent No. 5,616,168 (Gabb) and U.S. Patent No. 3,957,602 (Johnson). Applicants respectfully traverse this rejection for the reasons given below.

Schlitt relates to a method for improving overall copper recovery from iron-containing copper ore materials (e.g., low-grade copper ores and mine wastes) in an integrated mining and metallurgical process. These ore materials are mined, and higher grade portions are smelted, while lower grade portions are leached with

aqueous, weakly acidic aqueous lixiviant to produce an acidic, ferric, effluent solution. Slag from the smelter is leached with this effluent solution, and copper is recovered from the resulting pregnant solution (without precipitation of ferric salts) by converting the copper sulfate in the pregnant leach solution with metallic iron to form metallic copper. See Schlitt at column 2, lines 42-45 and column 6, lines 45-47.

This precipitated metallic copper is recycled to the smelter.

In summary, Schlitt describes leaching of low-grade pyritic ore and using the formed solution to leach copper smelter slag. Copper values of the low-grade ore and the slag are recovered from the solution as elemental copper that is fed into a smelting furnace. Schlitt, as admitted by the Examiner, does not disclose forming a copper sulfide by reaction of a copper sulfate solution with a sulfide-containing concentrate, and the recycling of this copper sulfide solution to the smelter. Schlitt also fails to disclose or suggest leaching smelter slag with an acid, an oxygen-containing gas, and copper-depleted iron sulfate solution, or the precipitation of iron from the leaching step with the aid of oxygen-containing gas.

Gabb relates to a method for treating flue dust from a smelter source by leaching with acidic solution to dissolve copper, arsenic, bismuth, antimony, etc. in the dust, to form a solution that is treated in a precipitation stage to precipitate copper by contacting with sulfuric acid, sulfur, and/or sulfur dioxide. See Gabb at column 5, lines 10-13. Copper is precipitated as sulfide and returned to the smelter. However, Gabb does not disclose contacting copper sulfate with a sulfide-containing concentrate to form copper sulfide, or leaching smelter slag with an acid, oxygen-containing gas, and a copper-depleted iron sulfate solution, or the precipitation of iron in the leaching step.

Johnson relates to a method of leaching chalcopyrite with a copper sulfate solution to produce insoluble copper sulfide, soluble iron sulfate, and sulfuric acid.

Johnson states:

The copper sulfides can then be separated from the product mixture and further treated in order to recover the copper values. Also the products from the initial leach may be immediately subjected to a secondary oxidation leach reaction wherein the copper sulfides are converted to a soluble copper sulfate solution and the iron is converted to an insoluble state such that the copper sulfate solution is easily separated from the residual insoluble iron constituents along with any other insoluble impurities. The copper may then be conventionally recovered from the isolated copper sulfate solution, and if desired a portion of the copper sulfate solution may be recycled for reaction and conversion with fresh chalcopyrite feed. (Johnson at column 1, line 61 to column 2, line 6).

Johnson therefore discloses two alternative process embodiments (one embodiment wherein the copper sulfides are separated from the product mixture and further treated to recover copper values, and another embodiment where the products from the initial leach are immediately subjected to a secondary oxidation leach to convert copper oxides to soluble copper sulfate). Neither of these alternative process embodiments involves a leaching step that includes contacting slag or other solid substrate with a copper-depleted iron sulfate solution, an acid, and an oxygen-containing gas.

Even if one of ordinary skill in this art would have been motivated to combine the teachings of Schlitt with those of Gabb and Johnson, the result would not be a process wherein slag or dust from a smelter is leached with a copper-depleted iron sulfate solution, an acid, and an oxygen-containing gas, because none of the cited references teach such a process step. Additionally, the combined reference teachings do not suggest a process where iron is precipitated out of the leaching

step. Even if the second embodiment of Johnson et al. (containing two leaching steps) were followed, and insoluble iron precipitated out of a second leaching step, the recovered copper stream is in the form of copper sulfate, not copper sulfide, and there is no suggestion in any of the references that such a stream could or should be recycled to a smelter. Because the references, even if combined in the manner that the Examiner suggests, do not result in the process of claim 1, Applicants respectfully submit that the Examiner has failed to establish a *prima facie* case of obviousness.

Additionally, the Examiner does not adequately explain why one of ordinary skill in the art would have made such a combination of teachings. For example, the Examiner does not adequately explain why one of ordinary skill in the art would disregard the teachings of Schlitt to precipitate copper in a cementation process with metallic iron and replace this step with the production of copper sulfide. The Examiner states:

Schlitt teaches that the precipitated copper after cementation is recycled back to the smelter (col. 5, lines 34-36) however Gabb teaches instead of the subsequent solvent extraction/electrowinning (SX-EW) processes of the prior art, one can precipitate copper as a sulfide and return it to the smelter, the benefit being greater overall process efficiency (col. 7, lines 15-21). . . . Thus motivation to modify Schlitt comes from the reasonable expectation of greater overall process efficiency as taught by Gabb and the method of precipitating copper sulfide precipitates as taught by Johnson. (Office action dated April 4, 2008, pages 5-6).

However, the "reasonable expectation of greater overall process efficiency" is taught by Gabb to relate to some unspecified "prior art" electrowinning process, rather than to the cementation process disclosed in Schlitt.

Moreover, that Johnson may teach a method for precipitating copper sulfide does not, by itself, provide any reason for one of ordinary skill in the art to do so.

See MPEP § 2143.01(III); *KSR International Co. v. Teleflex Inc.*, 550 U.S. \_\_\_, \_\_\_, 82 USPQ2d 1385, 1396 (2007) (the mere fact that references can be combined or modified does not render the resultant combination obvious unless the results would have been predictable to one of ordinary skill in the art). Johnson does not disclose any process where the resulting copper product is recycled to a smelter, or is produced from smelter slag or dust. The Examiner asserts that:

Johnson adds that the conversion of copper leached from chalcopyrite ore and subsequently converted to copper sulfides allows for better separation based on differences in solubility (claims 1 and 9) as the copper sulfide is later treated to recover elemental copper (claim 1). (Office action dated April 7, 2008, pages 5-6.)

However, the claimed process does not recite the leaching of chalcopyrite ore. The process disclosed in Gabb does not involve the leaching of chalcopyrite ore. The second leaching step in Schlitt does not involve the leaching of chalcopyrite ore. All of these processes involve the leaching of smelter slag or dust. The Examiner has not explained why the use of the process of Johnson in such a context would yield predictable results. Applicants respectfully submit that, in light of the different compositions of a chalcopyrite-containing ore and a smelter slag, the results of a process like that of Johnson used with slag or dust feedstocks would not be predictable. Under such circumstances, Applicants respectfully submit that one of ordinary skill in this art would not have combined the teachings of Johnson with those of Schlitt and Gabb, as the Examiner has suggested should be done.

Applicants respectfully submit that one of ordinary skill in the art would not have combined the teachings of Schlitt, Gabb, and Johnson, for the reasons given above, and for this reason as well, the Examiner has failed to establish a *prima facie* case of obviousness of claim 1, and this rejection should be withdrawn.

B. Claims 8 and 11-19 over Schlitt, Gabb, Johnson, Heimala, and Richmond

In paragraph 5 of the Office action, the Examiner has rejected claims 8 and 11-19 under 35 U.S.C. § 103(a) as obvious over Schlitt in view of Gabb and Johnson, and further in view of U.S. Patent No. 5,108,495 (Heimala) and U.S. Patent No. 6,537,440 (Richmond). Applicants respectfully traverse this rejection for the reasons given below.

First, neither Richmond nor Heimala cure the deficiencies of Schlitt, Gabb, and Johnson described above. Since claims 12-19 all depend from claim 1, and incorporate the features of claim 1, these claims are not obvious over the cited references for the reasons given above with respect to claim 1.

Second, with regard to claims 12 and 13, the Examiner states:

Furthermore, Makinen (U.S. 4,717,419) teaches the valuable metals in copper slags are normally bound to silicates, ferrites, and other such compounds (col. 1, lines 45-49). (Office action dated April 7, 2008 at page 10).

Applicants note that Makinen is not cited in the Examiner's statement of rejection. If the Examiner intends to rely upon the teachings of a reference, it must be included in the statement of rejection. See *In re Hoch*, 166 USPQ 406 (CCPA 1970). The Examiner's failure to do so with the Makinen reference renders this rejection improper.

Third, with regard to claims 14, 15, and 16, the Examiner states in Office action dated April 7, 2008, at pages 10-11:

Schlitt teaches that temperature and pressure [are] not critical in the leach steps of his inventions and that his process is effectively carried out at ambient temperatures and pressures, and that the use of autoclaves or closed systems is not necessary.

The Examiner then goes on to state on page 11:

[B]oth Johnson and Heimala teach the use of autoclave leaching in recovering metal from copper sulfide ore. Richmond subsequently teaches that autoclave leaching should be carried out to address the deficiencies of the prior art processes (col. 2, lines 18-21 and Abstract, feature 20 in Figure 1).

Within less than a single page, the Examiner has taken the position that the prior art teaches that the use of an autoclave is unnecessary, and that the prior art teaches that the use of an autoclave is necessary.

The Examiner has relied upon the combined teachings of Schlitt, Johnson, Heimala, and Richmond in a single rejection. Applicants respectfully submit that the interpretation that one of ordinary skill places upon the teachings of the prior art should depend upon how one of ordinary skill in the art would view all of the cited references, and should not fluctuate between two extremes depending upon which claim the Examiner is trying to reject. That the Examiner interprets the cited prior art to both suggest the need to include an autoclave and to also suggest that an autoclave is unnecessary indicates that there is no clear teaching in the art either way, and suggests that the use of an autoclave would not have been obvious in the process disclosed by Schlitt. As a result, claim 16 is separately patentable, and its rejection should be withdrawn.

For at least the reasons given above, Applicants respectfully submit that the Examiner has failed to establish a *prima facie* case of obviousness of claims 12-19.

Applicants respectfully submit that claims 1 and 12-25 are in condition for immediate allowance, and an early notification to that effect is respectfully requested. If the Examiner believes that further issues remain to be resolved, he is respectfully



requested to contact the undersigned so that an interview may be arranged to discuss these remaining issues.

Respectfully submitted,

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